CONTRIBUTION TO THE LIFE HISTORY OF LILIUM PHILADELPHICUM.[1]

INTRODUCTION.

JOHN M. COULTER.

A group of research students, in connection with a general study of monocotyledons, selected *Lilium Philadelphicum* as a suitable type for somewhat special study. The end in view was to examine those structures so fully described by Guignard for *L. Martagon*, and treated in a supplementary way by subsequent investigators of the same plant. Abundant material of the local *L. Philadelphicum* was obtained, and the cultivated *L. tigrinum* was used also for comparison. The numerous preparations of thirteen investigators gave unusual opportunity for a broad range of observation, so that the facts herein set forth may be regarded as fairly established. As to questions of interpretation, there may well be diversity of opinion, as the present necessities of the case make almost every step in interpretation an inference. It is evident that the association of phenomena will suggest a causal relation, whose reality is plainly only an inference. Moreover, the comparatively obscure structures concerned in cell activity are peculiarly open to misinterpretation, both as to origin and function. The subject, therefore, is one in which dogmatism is singularly inappropriate, and in which every proposed causal sequence of events must be regarded as a suggestion rather than as an established fact.

Inasmuch as this work upon Lilium was but supplementary to the more formal investigation in which each investigator is engaged, my original purpose was to organize under a single caption all of the results that seemed worthy. As the work developed, however, certain parts of it seemed to demand more

[1] Contributions from the Hull Botanical Laboratory. V.

special attention. These special investigations were undertaken by Mr. Chamberlain and Mr. Schaffner, who have made an independent presentation of their results, for which they are entirely responsible. This contribution, therefore, is made up of three distinct and independent papers, each with its own plates, but naturally brought together by the nature of the subject.

My own part is the organization of observations made by the group of students referred to, in so far as they pertain to the embryo sac, fertilization, and the embryo. Mr. Chamberlain, from his own observations, deals with the pollen grain; while Mr. Schaffner presents his own observations and conclusions in reference to certain cytological phenomena connected with the "reduction division" in the embryo sac.

The material used was fixed in Flemming's weaker solution, Merkel's fluid, 1 per cent. chromic acid, 1 per cent. chromic acid with a trace of acetic acid, and picric acid.

Xylol was used almost exclusively to precede the paraffine bath. Serial sections were cut with a Thoma microtome, usually 5 or 10 μ thick, and occasionally but 1 μ thick.

A large number of stains and combinations was used. Cyanin and erythrosin proved excellent for most stages in the development of the macrospore; Delafield's haematoxylin is to be recommended for embryos; safranin with gentian violet and orange G gave good results in staining pollen grains; Heidenhain's iron alum haematoxylin used alone or with erythrosin or orange G gave by far the best preparations for cytological study.

I

THE EMBRYO SAC AND ASSOCIATED STRUCTURES.

JOHN M. COULTER.

(WITH PLATES XXXII–XXXIV)

The results here recorded traverse ground which has become very familiar. It will not be necessary, therefore, to make extended mention of all the phenomena, but to discuss only